

**INDIANA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS MANAGEMENT**

**SUPERPAVE GYRATORY COMPACTOR (SGC)
SPECIMEN FABRICATION
Directive No. 303**

Roadway plate samples are taken from behind the paver in accordance with ITM 580 and placed in cardboard transport containers lined with non-absorbent paper for delivery to a Production Laboratory. The samples require heating from ambient temperature to compaction temperature, sample reduction to specimen quantity, compaction in accordance with AASHTO T 312 and removal and cooling prior to subsequent testing for volumetric properties. The SGC specimen fabrication will be completed in a continuous sequence upon initiating sample heating. The sample will be charged in the mold and compacted within two hours after reaching the compaction temperature. A checklist for the lubrication and maintenance schedules of the gyratory compactor is included in Appendix A, and a proposed specimen fabrication timeline is included in Appendix B. The procedures will be as follows:

Gyratory Compactor Maintenance and Calibration/Verification Procedures

The procedures for the maintenance of the Pine SGC Model #AFG1A gyratory compactor and the calibration/verification procedures are required prior to compaction of any gyratory specimens. These procedures include:

1. The SGC Operations Manual recommended maintenance schedule is completed in accordance with the established checklist
2. Verification of calibration settings for the gyratory compactor is in accordance with ITM 908 on a one month schedule
3. Verification of the dimensions of the gyratory molds, top plates, and base plates is in accordance with ITM 913 on a 12 month schedule
4. Verification of the internal angle of the gyratory compactor is in accordance with AASHTO TP 71 simulated loading on a 12 month schedule
5. All SGC surfaces, rollers, plates, and molds are kept as clean as possible
6. The molds and top and bottom plate surfaces are wiped clean with WD 40 prior to each use

Sample Reduction

The procedures for reducing the sample to the quantity required for the gyratory specimen are as follows:

1. The cardboard sample transport container is closed, placed in a $300 \pm 9^{\circ}\text{F}$ (dense-graded HMA and SMA) or $260 \pm 9^{\circ}\text{F}$ (open-graded HMA) oven, and removed when within 50°F of the mixture compaction temperature

NOTE: If the cardboard transport container has been exposed to water, grease, solvents, oils, etc., the container contents will be transferred to a rectangular sample pan and covered before placement in the oven.

2. The mixture from the cardboard transport container is placed on the splitting board and reduced in accordance with ITM 587 to the target weight listed on the DMF/JMF form. The splitting board will be any flat surface free from contaminants such as HMA, aggregate, liquid asphalt, dirt, grease, excess solvents, etc., and may be preheated with heat lamps
3. The split samples are placed in rectangular sample pans lined with non-absorbent paper
4. The non-absorbent paper is folded over the top of the mixture and the ends are tucked into the sides of the pan so that the mixture is covered on all sides

Sample Heating and Temperature Measurements

The sample is heated to the required compaction temperature as follows:

1. The sample pans are placed in a $300 \pm 9^{\circ}\text{F}$ (dense-graded HMA and SMA) or $260 \pm 9^{\circ}\text{F}$ (open-graded HMA) oven
2. A thermometer is placed in the sample pan center mass and left for continuously reading of the mixture temperature by external digital readout
3. The mold and bottom plate are placed separately in the compaction oven or oven of the same temperature
4. Once the mixture temperature has been achieved, a dial contact surface thermometer is placed on the bottom plate to verify the temperature
5. The mold and bottom plate are kept in the oven until the bottom plate temperature is $300 \pm 9^{\circ}\text{F}$ for dense-graded HMA and SMA or $260 \pm 9^{\circ}\text{F}$ for open-graded HMA prior to assembling and charging the mold

Sample Mold Charging

The sample is charged into the gyratory mold as follows:

1. The sample, mold and bottom plate are removed from the compaction oven
2. The bottom plate is assembled in the bottom of the mold
3. A gyratory paper disk is placed on top of the bottom plate inside the heated mold assembly so that the specimen will be in contact with the non-print side. Pine gyratory paper disks are to be used.
4. The non-absorbent paper is grasped by the broad sides of the sample and lifted so as not to disturb the material from the sample resting position
5. The sample is positioned such that the long dimension of the sample is from left to right, not front to back
6. One end of the sample is placed onto the lip of the mold before lifting the back end of the sample and the sample is slid into the mold with one quick motion
7. The sample is leveled, if necessary, by a spatula
8. A paper disk is placed on top of the sample with the non-print side in contact with the specimen
9. The mold with sample is placed into the SGC and compacted to the specified design gyrations listed on the DMF/JMF form

Sample Extraction and Cooling

Dense-Graded and SMA

1. The specimen is raised level to the top of the mold and the paper disk is removed
2. The specimen is initially cooled in the mold for 10 minutes by directing a fan towards the top of the mold in the compactor
3. The specimen and base plate are extruded from the mold and placed on a flat surface
4. The specimen is lifted from the base plate and inverted on a flat surface
5. The paper disk is removed
6. The specimen is cooled overnight or until the surface temperature measured with a non-contact digital infrared thermometer is $77 \pm 9^{\circ}\text{F}$

Open-Graded

1. The specimen is raised level to the top of the mold
2. The specimen is initially cooled in the mold for 10 minutes by directing a fan towards the top of the mold in the compactor
3. The paper disk is removed
4. The specimen is extruded approximately 1.25 inches and the specimen is cooled with a fan for five minutes
5. The specimen is extruded an additional 1.25 inches (2.50 inches total) and cooled with a fan for five minutes
6. The specimen is extruded an additional 1.25 inches (3.75 inches total) and cooled with a fan for five minutes
7. The specimen and base plate are extruded from the mold and placed on a flat surface
8. The specimen is lifted from the base plate and inverted on a flat surface
9. The paper disk is removed
10. The specimen is cooled overnight or until the surface temperature measured with a non-contact digital infrared thermometer is $77 \pm 9^{\circ}\text{F}$

Specimen Requirements

Two specimens are prepared from one roadway plate sample and the Bulk Specific Gravity (G_{mb}) is determined for each sample in accordance with AASHTO T 166. The two G_{mb} results are averaged to obtain one G_{mb} value. The gyratory specimens are checked for the following requirements:

1. The compacted height of each specimen is required to be $115 \pm 5\text{mm}$. If the height of a specimen is not within these tolerances, the specimen is discarded.
2. Two specimens prepared by the same operator should have G_{mb} values within 0.020 of each other. If the specimens are not within these limits, the G_{mb} values may be used for subsequent determination of the volumetric properties of the mixture; however, the procedures contained within this Directive should be reviewed prior to compaction of additional specimens.

**FABRICATION OF HOT MIX ASPHALT SPECIMENS
BY MEANS OF THE
SUPERPAVE GYRATORY COMPACTOR
DIRECTIVE No. 303**

APPARATUS

- [] Superpave Gyratory Compactor
 - [] Maintenance schedule in accordance with recommended frequency
 - [] ITM 908, Verifying Calibration Settings for SGC, done monthly
 - [] ITM 913, Verifying SGC molds, top plates and bottom plates, done annually
 - [] AASHTO TP71, Evaluation of SGC Internal Angle of Gyration using Simulated Loading, done annually
 - [] All SGC surfaces, rollers, plates and molds are clean
 - [] Molds and plates wiped clean before each use with WD40
- [] Oven themostatically controlled to $\pm 5^{\circ}\text{F}$
- [] Digital infrared thermometer
- [] External digital thermometer
- [] Dial contact surface thermometer

PROCEDURE – SAMPLE REDUCTION

- [] Transport container closed or sample covered and placed in oven
 - [] $300 \pm 9^{\circ}\text{F}$ for dense-graded HMA or SMA
 - [] $260 \pm 9^{\circ}\text{F}$ for open-graded HMA
- [] Sample removed within 50°F of compaction temperature
- [] Mixture placed on contaminant free splitting board or flat surface
- [] Mixture reduced by ITM 587 to target weight from DMF/JMF
- [] Split samples placed in rectangular pans lined with non-absorbent paper
- [] Non-absorbent paper folded and tucked to ensure mixture is covered on all sides

PROCEDURE – HEATING AND TEMPERATURE MEASUREMENTS

- [] Sample pan placed in oven
 - [] $300 \pm 9^{\circ}\text{F}$ for dense-graded HMA or SMA
 - [] $260 \pm 9^{\circ}\text{F}$ for open-graded HMA
- [] Thermometer placed in pan center mass and mixture temperature determined by external digital thermometer
- [] Mold and bottom plate placed separately in compaction oven or oven of same temperature
- [] Once the mixture temperature has been achieved, a dial contact surface thermometer is placed on the bottom plate to verify temperature
 - [] $300 \pm 9^{\circ}\text{F}$ for dense-graded HMA or SMA
 - [] $260 \pm 9^{\circ}\text{F}$ for open-graded HMA

PROCEDURE – MOLD CHARGING

- ☐ Sample, mold and bottom plate removed from oven
- ☐ Mold assembled
- ☐ Pine paper disk placed inside mold with non-print side in contact with mixture
- ☐ Non-absorbent paper grasped by the broad sides and sample slid into the mold with one quick motion
- ☐ Sample leveled by spatula, if required
- ☐ Paper disk placed on top of sample with non-print side touching mixture
- ☐ Mold placed in SGC and compacted to specified gyrations per DMF/JMF within two hours of reaching compaction temperature

PROCEDURE – COOLING (Dense Graded and SMA)

- ☐ Specimen raised level to top of the mold and paper disk removed
- ☐ Fan directed toward top of mold in compactor
- ☐ Specimen and mold cooled by fan for 10 min
- ☐ Specimen and base plate removed from mold and placed on flat surface
- ☐ Specimen lifted from base plate and inverted
- ☐ Paper disk removed
- ☐ Specimen cooled overnight or until surface temperature measured with non-contact digital infrared thermometer is $77 \pm 9^{\circ}\text{F}$

PROCEDURE – COOLING (Open Graded)

- ☐ Specimen raised level to top of the mold
 - ☐ Fan directed toward top of mold in compactor
 - ☐ Specimen and mold cooled by fan for 10 min
 - ☐ Paper disk removed
- ☐ Specimen extruded approximately 1.25 in. and cooled with a fan for 5 min
- ☐ Specimen extruded a total of approximately 2.50 in. and cooled with a fan for 5 min
- ☐ Specimen extruded a total of approximately 3.75 in. and cooled with a fan for 5 min
- ☐ Specimen and base plate extruded from mold and placed on flat surface
- ☐ Specimen lifted from base plate and inverted on flat surface
- ☐ Paper removed
- ☐ Specimen cooled overnight or until surface temperature measured with non-contact digital infrared thermometer is $77 \pm 9^{\circ}\text{F}$

NA - Not Applicable

X - Requires Corrective Action

√ - Satisfactory

 Acceptance Technician

 INDOT

 Comments

 Date

SUPERPAVE GYRATORY LUBRICATION/MAINTENANCE SCHEDULE**LUBRICATION SCHEDULE**

| Component | Daily | Initial 5 Hours | Every 25 Hours |
|---------------------|--------------|------------------------|-----------------------|
| Ram Foot | B | | |
| Ball Screw Bearings | | A | A |
| Ball Screw | | A | A |
| Actuator Bearings | | A | A |
| Mold Clamp Pivot | | | B |
| Mold Top Clamps | | | B |

Type of Lubrication: A -- Grease (NLGI Grade 2 Lithium Soap)**B -- Anti-Seize Lubricant**

| Component | Hours on SGC at Time of Lubrication | | | | | |
|---------------------|--|--|--|--|--|--|
| Ball Screw Bearings | | | | | | |
| Ball Screw | | | | | | |
| Actuator Bearings | | | | | | |
| Mold Clamp Pivot | | | | | | |
| Mold Top Clamps | | | | | | |

MAINTENANCE SCHEDULE

| Component | Daily | Initial 5 Hours | Every 25 Hours |
|---------------------------|--------------|------------------------|-----------------------|
| Clean Compaction Chamber | X | | |
| Clean Mold Top | X | | |
| Inspect Ram Key | | | X |
| Check Mold Base Clamps | | X | X |
| Timing Belt Tension | | X | X |
| Inspect Mold Clamps | | X | X |
| Inspect Ram Foot for Wear | | | X |

| Component | Hours on SGC at Time of Maintenance | | | | | |
|---------------------------|--|--|--|--|--|--|
| Inspect Ram Key | | | | | | |
| Check Mold Base Clamps | | | | | | |
| Timing Belt Tension | | | | | | |
| Inspect Mold Clamps | | | | | | |
| Inspect Ram Foot for Wear | | | | | | |

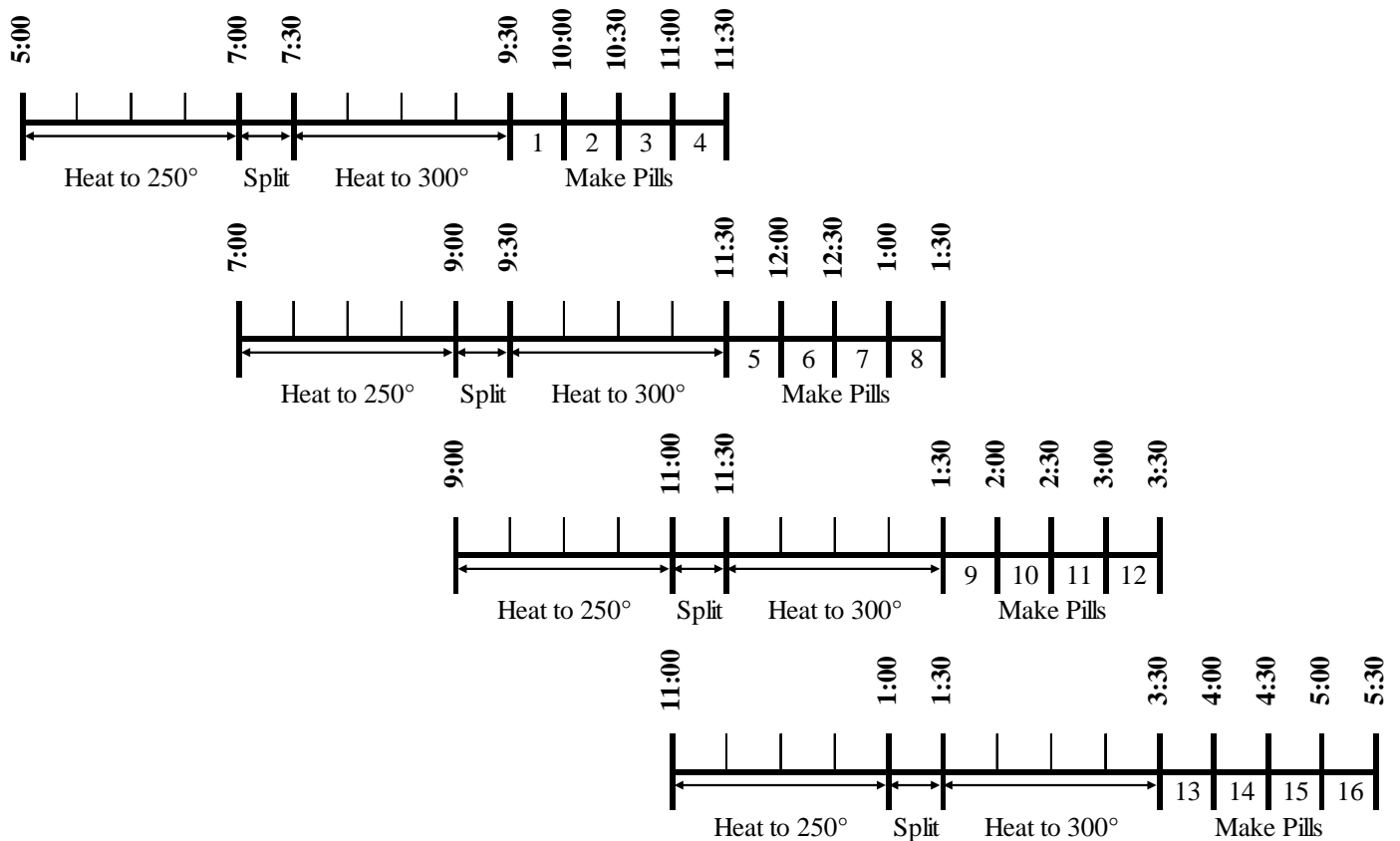
Remarks: _____

Verified by: _____

Date: _____

Next Date Due: _____

Proposed Specimen Fabrication Timeline



Conditions

1. One technician
2. Two roadway sample boxes placed in compaction oven per cycle
3. Two hours allotted to heat two boxes to splitting temperature
4. Thirty minutes allotted to split two roadway sample boxes into four samples
5. Two hours allotted to heat the four split samples to compaction temperature
6. Thirty minutes allotted to compact each sample

Continuation

